

NDVI-Characteristics of Landscape Types in the Arctic/Alpine-Boreal Transition area in northern Fennoscandia

Stein Rune Karlsen, NORUT Information Technology, P.O.Box 6434, N-9291 Tromsø, Norway, stein-rune.karlsen@itek.norut.no; Bernt Johanson, NORUT Information Technology, P.O.Box 6434, N-9291 Tromsø, Norway, bernt.johanson@itek.norut.no; Kjell-Arild Høgda, NORUT Information Technology, P.O.Box 6434, N-9291 Tromsø, Norway, kjell-arild.hogda@itek.norut.no

Northern Fennoscandia is characterized by three steep climatic gradients running from north to south (vegetation zones), from the oceanic coast to the continental interior (vegetation sections), and from lowlands to mountains. Regional differences in vegetation and the onset of the growing season are associated with these climatic gradients. The oceanic area has early greenup and deciduous birch forests and crowberry heaths dominate. Coniferous forests, lichen heaths, and oligotrophic mires are common in the interior, while dwarf birch-crowberry heaths and willow shrubs dominates the southern-arctic and low-alpine parts.

The following environmental geo-data were organized in ArcGIS 9.1: Landsat TM/ETM+ based vegetation maps, digital terrain models, and surface phenological and climatic data. Time series of the MODIS Level 3 16-day composite 250 meter NDVI satellite data for the 2000 to 2005 period were processed. The MODIS-data were calibrated and a new rule-based method found the onset and end of the growing season on pixel-by-pixel basis.

From the Landsat TM/ETM+ based vegetation map homogenous landscapes types were identified along the three climatic gradients. The 6-years mean NDVI values were calculated for these homogenous sites. The middle and high alpine belts were not included in the study due to too scattered vegetation cover.

The NDVI characteristics among the landscape types revealed two important findings. The first is about the differences between the spring and autumn period. In the spring period the differences in the start of the steep increase of the NDVI values among the landscapes types were about two months within the region, while at autumn the differences in the start of the steep decrease of the NDVI values were only about one month. At spring there were a clear pattern following the three main gradients, while at autumn it only slightly follow the altitude and oceanic gradients. This indicating different set of climatic variables controlling the decrease in NDVI values at autumn compared with the spring period.

The second important finding occurs when we compared the differences in NDVI value during the growing season between the southern-arctic/low-alpine heaths and the deciduous birch forested areas in the northern boreal lowland. The arctic/alpine heaths showed on average only small variation in NDVI value from the end of June to the

middle of September, and then a steep decrease in NDVI value occur in second half of September. The birch forested areas on the other hand showed a clear decrease of NDVI values in late August, which is 2-3 weeks earlier compared with the higher latitude/altitude areas.

The unexpected behaviour of the arctic/alpine heath types could partly be a result of spots of snowbed vegetation with late NDVI peak values not catch by the Landsat based vegetation maps with 30m resolutions.